



ICAO ENGINE nvPM EMISSIONS DATA SHEET

SUBSONIC ENGINES

ENGINE IDENTIFICATION: CFM56-5B2/3 BYPASS RATIO (-): 5.5
 UNIQUE ID NUMBER: 01P08CM103 PRESSURE RATIO π_{co} (-): 31.3
 COMBUSTOR: Tech Insertion
 ENGINE TYPE: TF RATED OUTPUT F_{co} (kN): 137.9

REGULATORY DATA

CHARACTERISTIC VALUES:	LTO_{mass}/F_{co} (mg/kN)	LTO_{num}/F_{co} (particles/kN)	NVPM MASS CONCENTRATION ($\mu\text{g}/\text{m}^3$)
LTO/ F_{co} AND MAX nvPM _{mass}	138.0	9.48E+14	2897
AS % OF CAEP/10 LIMIT	-	-	51.3
AS % OF CAEP/11 LIMIT (InP)	8.2	8.5	
AS % OF CAEP/11 LIMIT (NT)	46.4	24.9	

MEASURED DATA

MODE	POWER SETTING (% F_{co})	TIME minutes	FUEL FLOW kg/s	EMISSIONS INDICES*		NVPM MASS CONCENTRATION PEAK nvPM _{mass} ($\mu\text{g}/\text{m}^3$)
				EI _{mass} (mg/kg)	EI _{num} (particles/kg)	
TAKE-OFF	100	0.7	1.385	84.2	3.66E+14	
CLIMB OUT	85	2.2	1.107	58.0	4.22E+14	
APPROACH	30	4.0	0.358	2.1	8.49E+13	
IDLE	7	26.0	0.111	0.7	2.22E+13	
LTO TOTAL (kg, mg, number of particles)			463	13681	9.41E+16	-
NUMBER OF ENGINES				1	1	1
NUMBER OF TESTS				3	3	3
AVERAGE LTO/ F_{co} VALUES (mg/kN, particles/kN)				99.2	6.82E+14	-
MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ($\mu\text{g}/\text{m}^3$)				84.2	4.34E+14	2251

* Emissions Indices are corrected for thermophoretic loss and fuel hydrogen content

DATA FOR EMISSIONS INVENTORIES (ESTIMATIONS FOR ENGINE EXIT PLANE VALUES)

MODE	POWER SETTING (% F_{co})	CORRECTED EMISSIONS INDICES	
		EI _{mass_SL} (mg/kg)	EI _{num_SL} (particles/kg)
TAKE-OFF	100	96.0	8.42E+14
CLIMB OUT	85	68.4	1.13E+15
APPROACH	30	3.2	4.72E+14
IDLE	7	1.0	1.07E+14

AMBIENT CONDITIONS

	From		To	
	BAROMETER (kPa)	99.5	100.2	HEAT OF COMBUSTION (MJ/kg)
TEMPERATURE (K)	295.5	311.8	HYDROGEN CONTENT (%mass)	13.83
HUMIDITY (kg water/kg dry air)	0.0066	0.0122	AROMATICS CONTENT (%vol)	18.7
			NAPHTHALENE CONTENT(%vol)	0.67
			SULPHUR CONTENT (ppm by mass)	519

MANUFACTURER: CFM International
 TEST ORGANIZATION: Safran Aircraft Engines
 TEST LOCATION: Villaroche, France
 TEST DATES: 25/07/2019-30/07/2019

REMARKS

- Engine 849-166/1
- Certification Report CR-2097/3 SUPPLEMENT 2-5B, CR-2097/3 SUPPLEMENT 2-7B